Enterprise Transportation Data Management Scalability & Deployment Issues

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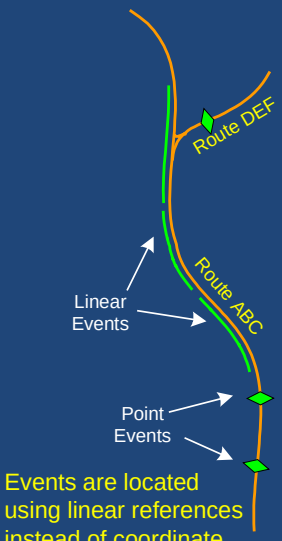
Overview

- Dynamic Segmentation as a process
- LRS Processing Models
  - Traditional Clients
  - Web Servers
  - Application Servers
  - Embedded Servers
- Issues with Scalability
- Issues with Deployment

Generating Locations



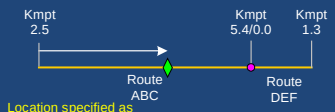
Events are located using linear references instead of coordinate information.

- For each event record to be processed
  - Search for records with matching LRS keys
  - Sort records on measures
  - Calculate relative location
- Efficiencies gained by indexing
- Impacts of
  - LRS Model
    - Organization of linear metric
  - Data Model
    - Normalization
    - LRS Pathologies
- Trade-off of between data model, data management, and processing

LRS Models

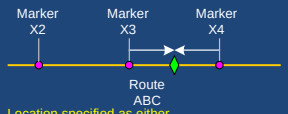
- Three Fundamental LRS Models
  - Route-Measure
  - Marker-Offset
  - Link-Node
- Many implementations
  - GIS Vendors
  - In-house systems
  - Hybrids
- LRS Models have different processing requirements and system-level impacts

Route Measure Method



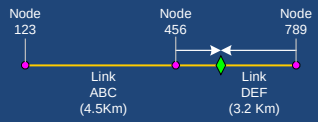
Location specified as
Route ABC, 4.2Km

Marker-Offset Method

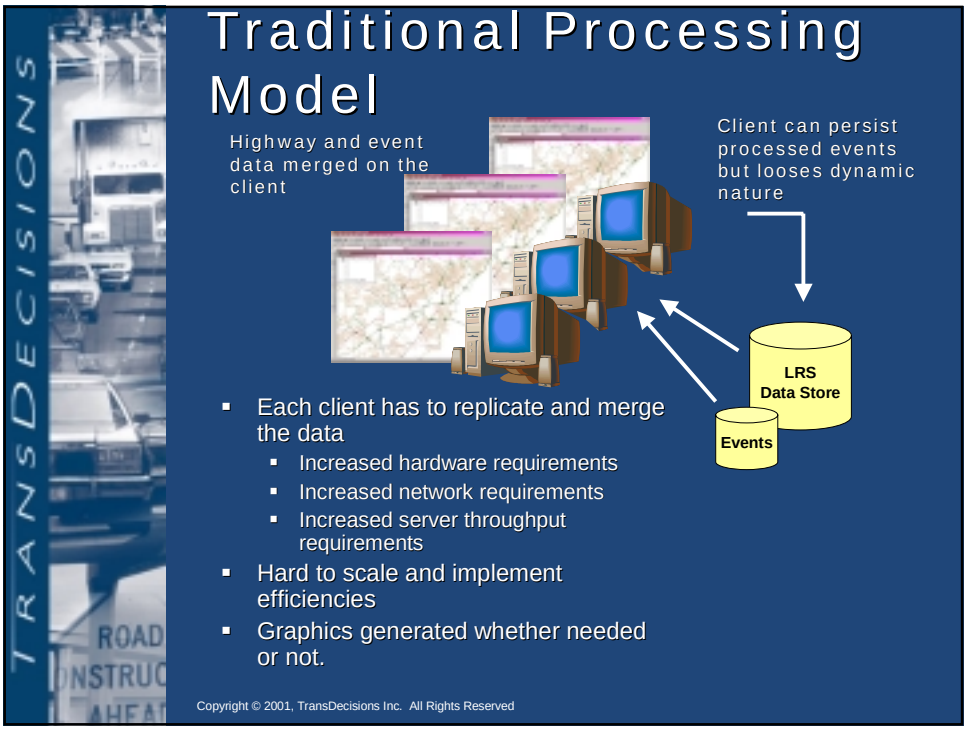


Location specified as either
Route ABC, X3 +0.5
or
Route ABC, X4 -0.5

Link Node Method



Location specified as either
Node 456 Edge DEF +1.1Km
or
Node 789 Edge DEF +2.1Km


TRANSDECISIONS
Traditional Processing Model
Highway and event data merged on the client
Client can persist processed events but looses dynamic nature
LRS Data Store
Events
Each client has to replicate and merge the data
Increased hardware requirements
Increased network requirements
Increased server throughput requirements
Hard to scale and implement efficiencies
Graphics generated whether needed or not.
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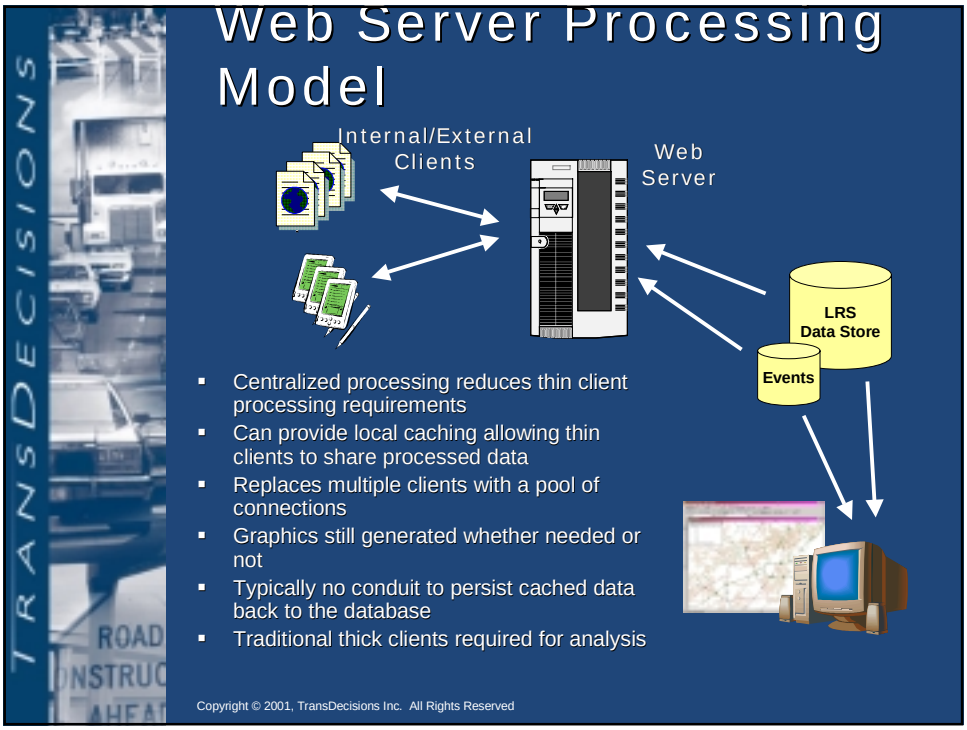
TRANSDECISIONS
Web Server Processing Model
Internal/External Clients
Web Server
LRS Data Store
Events
Centralized processing reduces thin client processing requirements
Can provide local caching allowing thin clients to share processed data
Replaces multiple clients with a pool of connections
Graphics still generated whether needed or not
Typically no conduit to persist cached data back to the database
Traditional thick clients required for analysis
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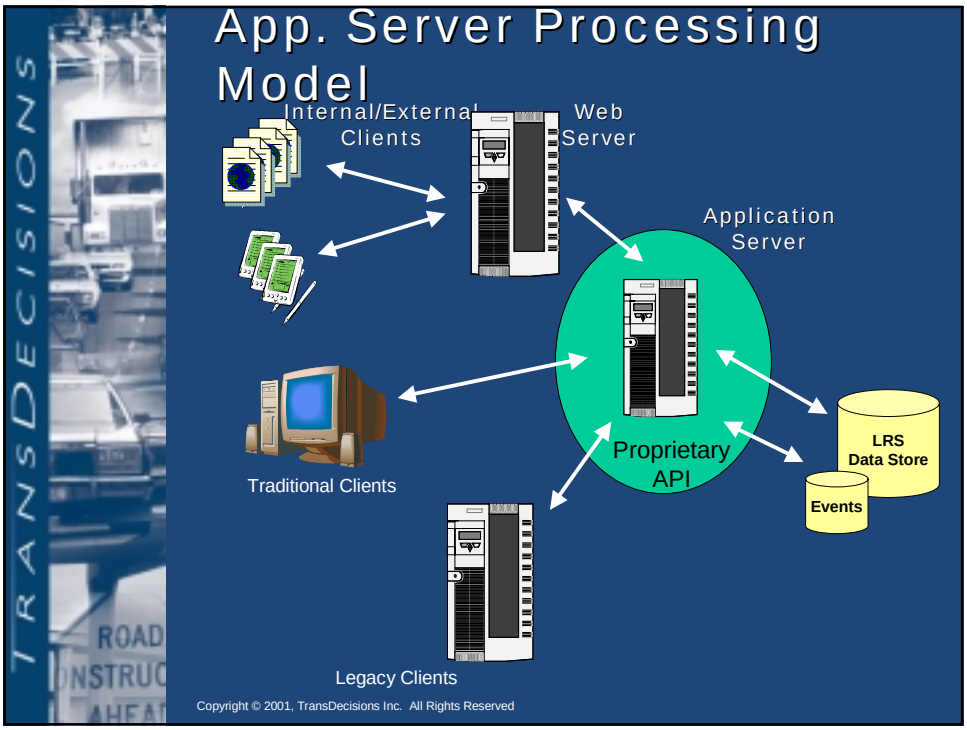
TRANSDECISIONS
App. Server Processing Model
Internal/External Clients
Web Server
Application Server
Proprietary API
LRS Data Store
Events
Traditional Clients
Legacy Clients
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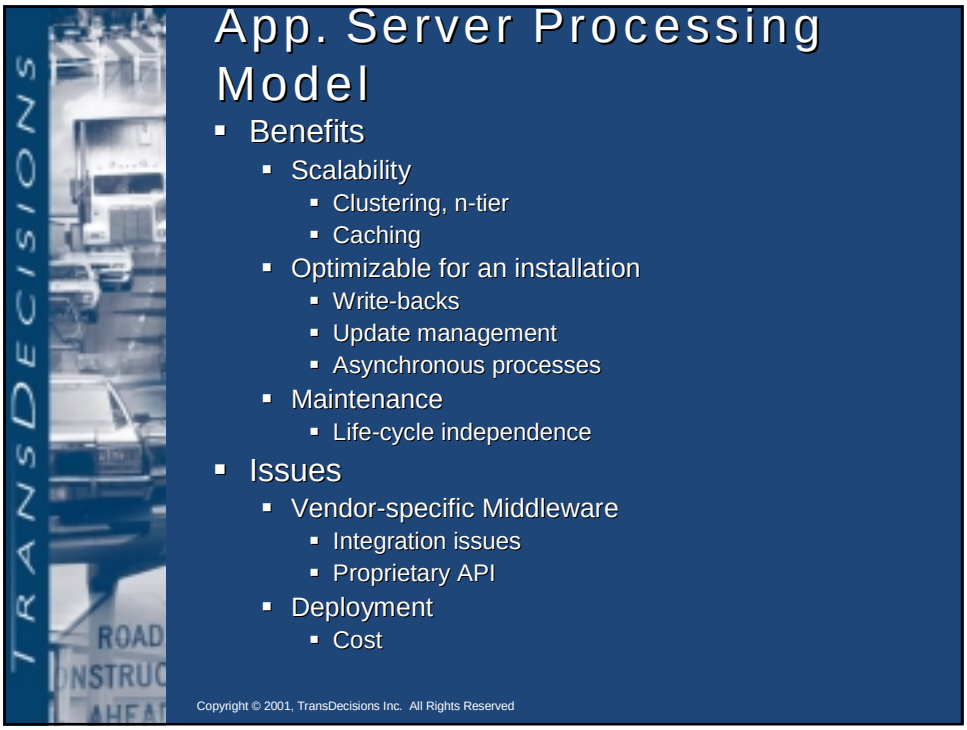
TRANSDECISIONS
App. Server Processing Model
Benefits
Scalability
Clustering, n-tier
Caching
Optimizable for an installation
Write-backs
Update management
Asynchronous processes
Maintenance
Life-cycle independence
Issues
Vendor-specific Middleware
Integration issues
Proprietary API
Deployment
Cost
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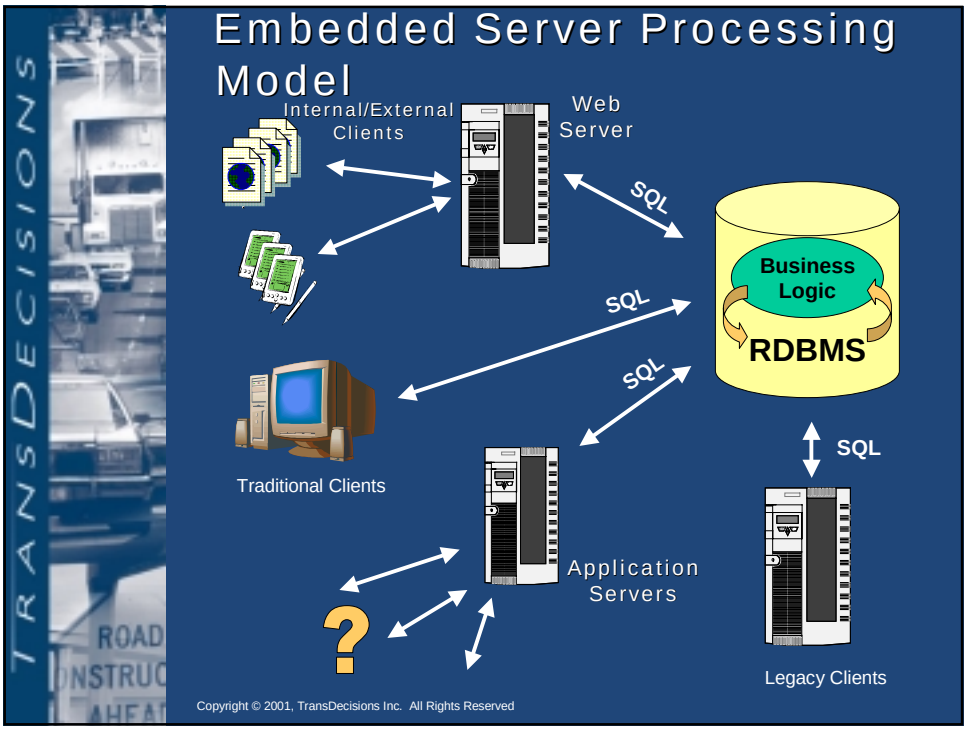
TRANSDECISIONS
Embedded Server Processing Model
Internal/External Clients
Web Server
SQL
Business Logic
RDBMS
SQL
SQL
SQL
Traditional Clients
Application Servers
Legacy Clients
?
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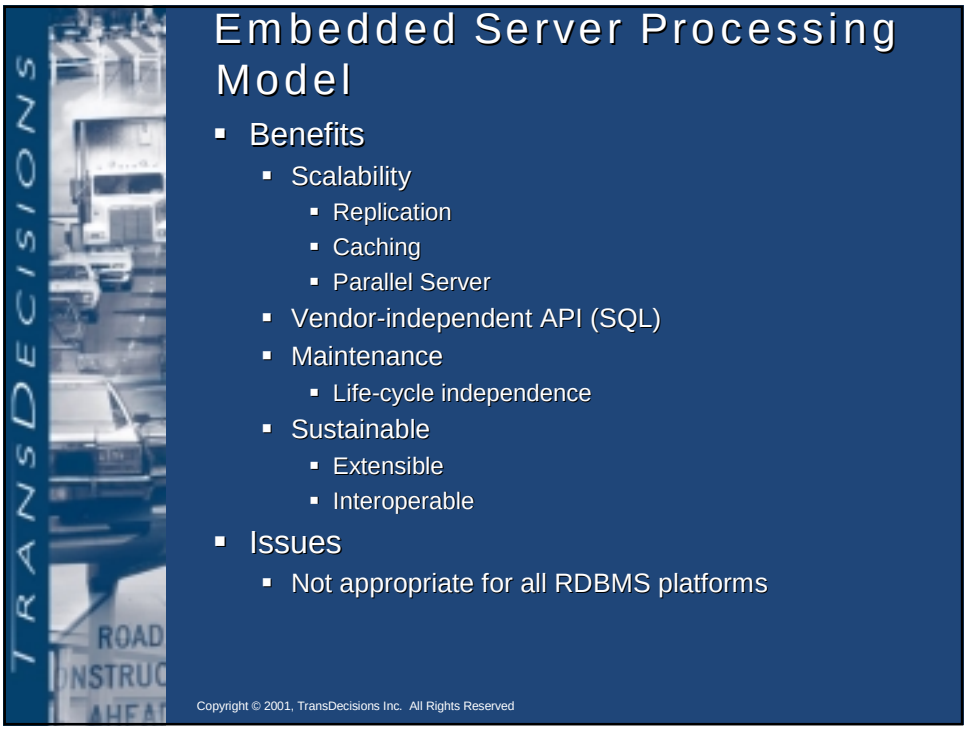
TRANSDECISIONS
Embedded Server Processing Model
Benefits
Scalability
Replication
Caching
Parallel Server
Vendor-independent API (SQL)
Maintenance
Life-cycle independence
Sustainable
Extensible
Interoperable
Issues
Not appropriate for all RDBMS platforms
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Selection Criteria

- Selection of a processing model should be reflect the institutional approach to Information Systems Management
- Differentiate systems on
  - Required Functionality
  - Maintainability
  - Sustainability

Maintainability

- Ability to keep the existing system running through dependent product cycles
- GIS Context
  - Ability to edit, extend, and generally manage the highway network in-house
- Information Systems Context
  - Leverage existing in-house knowledge and skills
- Corporate Context
  - Remove reliance on contractor or third-party-vendors to maintain the system.

Focus on the implementation details of the application

Sustainability

- Ability to sustain the utility of the application through time
- Ability to integrate new client and legacy applications
- Differs from maintenance criteria
  - Migration to new hardware organizations
  - Interoperability
  - Multi-faceted API

Focus on the system architecture, life-cycle, and extensibility of the application